Dr. Eva C. Herbst

Personal Information

Address: Palaeontological Institute and Museum
Karl-Schmid-Strasse 4, 8004 Zurich, Switzerland
email: eva.herbst@pim.uzh.ch

Website - **GoogleScholar** - **Github** - **Figshare** - **Morphosource** - **Publons** - **Orcid**

Education

Oct 2016 - April 2020	PhD in Biomechanics and Palaeontology *Structure and Motion Lab, Royal Veterinary College, London* Supervisors: Prof. John R. Hutchinson and Dr. Chris Richards
August 2012 - May 2016	B.A. in Integrative Biology *U.C. Berkeley*
Oct 2013 - June 2014	Degree of Higher Education in Biomedical Sciences *Durham University* Year of Study Abroad, Certificate of Higher Education

Employment and Research Experience

Dec 2019 - present	Postdoctoral Researcher *Investigating form and function of Triassic reptile skulls* *Palaeontological Institute and Museum, University of Zurich*
Oct 2019 - present	Lead Researcher OATech+ Network Pump Priming Project *Analysing bony architecture to monitor osteoarthritis of the knee* *Royal Veterinary College, London and University of Zurich*
Oct 2019 - Dec 2019	OATech+ Network Early Career Researcher Placement *Osteoarthritis project, Skeletal Biology Group, Royal Veterinary College London*
Oct 2016 - April 2020	PhD in Palaeontology and Biomechanics *Structure and Motion Lab, Royal Veterinary College, London*
May 2016 - July 2016	National Science Foundation Research Experience for Undergraduates Project: *Comparative Biomechanics, Palaeontology, and Evolution, University of Missouri*
Sept 2015 - May 2016	Undergraduate Research Apprenticeship Program *Hummingbird Flight Analysis, U.C. Berkeley*
Sept 2014 - May 2016	Research Assistant and Archivist *Human Evolution Research Center, U.C. Berkeley*

June 2013 - May 2016 Research Intern and Staff
Safari West Osteology, Santa Rosa, California

Sept 2014 - May 2015 Undergraduate Research Apprenticeship Program
Rodent Mandible Morphology Project, U.C. Berkeley

Honors and Awards

2021 **D. Dwight Davis Award, Society of Integrative and Comparative Morphology**
Best student oral presentation in the Division of Vertebrate Morphology

2020 **Swiss Commission of Palaeontology Prize**
Best presentation in palaeontology given at the Swiss Geoscience Meeting

2016 **Franklin M. Henry Award, Integrative Biology, UC Berkeley**
Outstanding achievement in human performance and health research

2016 **Distinction in General Scholarship, UC Berkeley**
Awarded to graduates achieving high grade point average

2013, 2015 **Dean's Honors, UC Berkeley**
Awarded to graduates achieving high grade point average

Peer-Reviewed Publications

* denotes co first author

2022 **Herbst, E. C.**, Lautenschlager, S., Fioritti, N., Meade, L., Scheyer, T.M.
A toolbox for the retrodeformation and muscle reconstruction of fossil specimens in Blender
In press for *Royal Society Open Science*

2022 **Herbst, E. C.**, Eberhard, E., Richards, C., Hutchinson, J.R. *In vivo* and *ex vivo* range of motion in the fire salamander *Salamandra salamandra*. *Journal of Anatomy*

2022 **Herbst, E. C.***, Eberhard, E.*, Hutschinson, J. R., Richards, C. Spherical frame projections for visualizing joint range of motion, and a complementary method to capture mobility data *Journal of Anatomy*

2022 **Herbst, E. C.***, Manafzadeh, A. R.*, Hutchinson, J. R. Multi-joint analysis of pose viability supports the possibility of salamander-like hindlimb configurations in the Permian tetrapod *E. megacephalus*.
Student Awardee Paper, *Journal of Integrative and Comparative Anatomy*

2021 **Herbst, E. C.**, Lautenschlager, S., Bastiaans, D., Miedema, F., Scheyer, T. M.
Modeling tooth enamel in FEA comparisons of skulls: comparing common simplifications with biologically realistic models. *iScience 24(11)*

2021 **Herbst, E. C.**, Felder, A. A., Evans, L. A. E., Ajami, S., Javaheri, B., Pitsillides, A. A. A new straightforward method for semi-automated segmentation of trabecular bone from cortical bone in diverse and challenging morphologies. *Royal Society Open Science* 8(8)
Our image was selected for the journal cover

2020 Ortega-Jimenez, V. M., **Herbst, E. C.**, Leung, M. S., and Dudley, R. Natural barriers: waterfall transit by small flying animals. *Royal Society Open Science* 7201185

2019 **Herbst, E. C.**, Doube, M., Smithson, T. R., Clack, J., and Hutchinson. J. R. Bony lesions in early tetrapods and the evolution of mineralized tissue repair. *Paleobiology* 45(4)

2010 **Herbst, E. C.** and Hutchinson, J. R. New insights into the morphology of the Carboniferous tetrapod *Crassigyrinus scoticus* from computed tomography. *Earth and Environmental Science Transactions of The Royal Society of Edinburgh* 109(1-2)

Papers in Review

2021 **Herbst, E. C.**, Evans, L. A. E.*, Felder, Jahaveri, B., Pitsillides, A. A.
3D profiling of mouse epiphyses across ages reveals new rl
potential imaging biomarkers of early spontaneous osteoarthritis
submitted to Journal of Anatomy

Grants and Funding

2021 **ImagingBioPro Network Online Educational Material Grant**
development of educational materials (videos and guides) and code
mesh manipulation and trabecular segmentation
Funds: 1,000 GBP

2020 **University of Zurich GRC Grant**
Project: organized and hosted finite element analysis conference and workshop with over 200 participants and developed a website and Github organisation for sharing finite element modeling methods
Funds: 10,000 CHF

2019 **OATech+ Network Biomechanics and Mechanobiology Pump Priming Fund**
Project: Using 3D trabecular architecture as a biomarker to identify and monitor osteoarthritis of the knee
Funds: 10,000 GBP

2019 **OATech+ Network Early Career Researcher Placement**
Placement with Prof Andrew Pitsillides at RVC to work on osteoarthritis project (see above)
Funds: 3,000 GBP

2019 **Royal Veterinary College Foreign Travel Fund**
To present research at ICVM conference
Funds: 300 GBP

2018 **Royal Veterinary College Foreign Travel Fund**
To present research at SICB conference
Funds: 300 GBP

2016 **Research Experience for Undergraduates, National Science Foundation**
Biomechanics research internship with Prof. Casey Holliday and Prof. Kevin Middleton, University of Missouri
Funds: 3,500 USD

Invited Talks and Workshops

2021 *Computational tools to investigate 3D form and function in extinct and extant taxa.*
Palaeontology Discussion Group Seminar Series, University of Bristol, UK

2021 *Reconstructing feeding function in Triassic reptiles: computational methods biomechanical analyses.* Public Colloqium Series, Palaeontological Institute and Museum, University of Zurich, Switzerland

2021 *Trabecular bone segmentation workshop*
Senckenberg Museum and Research Institute, Frankfurt, Germany.
Recording available on Youtube.

2021 *Motion capture and computational approaches to investigate joint range of motion*
Palaeontology Discussion Group, University of Birmingham, UK.

2021 *Workshop: how to clean 3D meshes in Blender*
FunkyMUG (Functional Morphology Users Group). Recording available on Youtube.

2021 *New methods support the possibility of a salamander-like walk in the Permian tetrapod Eryops.* Comparative Zoology Lab, Humboldt University Berlin, and Natural History Museum Berlin, Germany.

2020 *Investigating joint range of motion in salamanders and early tetrapods.*
Evolutionary Morphology and Biomechanics Group, University of Liverpool, UK.

2019 *Computational analysis of the evolution of amphibian locomotor modes.*
Postgraduate Research Day, Final Year PhD Session, Royal Veterinary College, London.

2017 *Functional morphology of Crassigyrinus scoticus: gaining insight into locomotor evolution in early tetrapods.*
Postgraduate Research Day, Royal Veterinary College, London. (Poster)

2017 *Computational analysis of the evolution of amphibian locomotor modes.*
Postgraduate Seminar Series, Royal Veterinary College, London.

Conference Presentations

* denotes co first author, first author listed = presenting author

2021 Evans, L. A. E.*, **Herbst, E. C.***, Felder, A. A., Ajami, S., Jahaveri, B., Pitsillides, A. A.
Do age-related differences in healthy and osteoarthritic mouse tibias show future imaging biomarkers?
Anatomical Society Summer Meeting Glasgow. Abstract published in

2021 Evans, L. A. E.*, **Herbst, E. C.***, Felder, A. A., Ajami, S., Jahaveri, B., Pitsillides, A. A.
Do age-related epiphyseal bone differences in osteoarthritic SRT/Ort versus healthy mouse tibias reveal future imaging biomarkers? British Orthopoedic Research Society. Online.

2021 **Herbst, E. C.**, Lautenschlager, S., Fioritti, N., Meade, L., Scheyer, T.M. 2021.
Modelling muscle volumes for finite element analysis and multibody dynamics
XVIII International Symposium on Computer Simulation in Biomechanics. Online. (Talk)

2021 Webb, N. M., Fornai, C., Krenn, V. A., **Herbst, E. C.**, Haeusler, M. 2021.
A tight squeeze for chimpanzees: the role of joint laxity and fetal head orientation during birth.
European Society for the Study of Human Evolution. Online. Abstract published in PaleoAnthropology, pg. 270

2021 Evans, L. A. E.*, **Herbst, E. C.***, Felder, A. A., Ajami, S., Jahaveri, B., Pitsillides, A. A.
Do 3D epiphyseal bone architectural changes in ageing STR/Ort and healthy mice reveal early imaging biomarkers of osteoarthritis? Bone Research Society Annual Meeting. Online. (Talk, winner of New Investigator Award). Abstract published in JMBR Plus, pg. 6

2021 **Herbst, E. C.**, Eberhard, E., Manafzadeh, A. R., Richards, C., Hutchinson, J. R.
New methods support the possibility of a salamander-like walk in the Permian tetrapod Eryops. Society for Integrative and Comparative Biology Annual Meeting, Online.
(Talk, winner of D. Dwight Davis Award Session)

2021 **Herbst, E. C.**, Bastiaans, D., Miedema, F., Scheyer, T. M., Lautenschlager, S. 2021.
How important is modeling tooth enamel in FEA comparisons of whole skulls? Comparing common simplifications with biologically realistic models.
Society for Integrative and Comparative Biology Annual Meeting, Online. (Poster)

2021 **Herbst, E. C.**, Bastiaans, D., Miedema, F., Scheyer, T. M., Lautenschlager, S. 2021.
How important is modeling tooth enamel in FEA comparisons of whole skulls? Comparing common simplifications with biologically realistic models.
Society for Integrative and Comparative Biology Annual Meeting, Online. (Poster)

2021 Bastiaans, D., **Herbst, E. C.**, Scheyer, T. M. Bringing fossils back to life: 3D cranial reconstructions of the highly flattened remains of thalattosauriformes.
Society for Integrative and Comparative Biology Annual Meeting, Online. (Talk)

2020 **Herbst, E. C.**, Eberhard E., Manafzadeh A. R., Richards C., Hutchinson J. R. 2020. Was the early tetrapod *Eryops* capable of a salamander-like walk? Developing new methods to test paleontological hypotheses about posture and gait. Swiss Geosciences Meeting, Online. (Talk, winner of Swiss Commission of Palaeontology Prize)

2020 Bastiaans, D., **Herbst, E. C.**, Scheyer, T. M. Re-fleshing fossils: cranial reconstructions of thalattosauriformes. Swiss Geosciences Meeting, Online. (Talk)

2020 Bastiaans, D., **Herbst, E. C.**, Webb, N. M., Haeusler, M. Scheyer, T. M. 3D Data, a gateway to open science: the FEZ initiative. OILS (Open Innovation in Life Sciences), Online. (Talk)

2020 Bastiaans, D., **Herbst, E. C.**, Scheyer, T. M. Virtual paleontology: a modern look at ancient material OILS (Open Innovation in Life Sciences), Online. (Talk)

2020 Bastiaans, D., **Herbst, E. C.**, Scheyer, T. M. Thalattosauriformes: schedelreconstructies van Triassische weirdos. NKVP (Nederlandse Kring van Vertebraten Paleontologen), Online (Talk).

2020 **Herbst, E. C.**, Felder, A. A., Evans, L. A. E. , Jahaveri, B., Ajami, S., Pitsillides, A. A.
A new automated method of segmenting trabecular bone: investigating subchondral trabecular changes as a predictor of osteoarthritis at the joint surface. Bone Research Society Annual Meeting, Online. (Poster). Abstract published in JMBR Plus pg. 51

2020 **Herbst, E. C.**, Eberhard, E., Richards, C., Hutchinson, J. R. Comparing in vivo and ex vivo knee range of motion in salamanders: a new method for investigating joint mobility. CAMS-Knee OpenSim Workshop, ETH, Zürich. (Poster)

2019 **Herbst, E. C.**, Eberhard, E. A., Richards, C. T., Hutchinson, J .R. 2019. A new method for investigating joint mobility and its relevance for inferring locomotor evolution in early tetrapods. 12th International Congress of Vertebrate Morphology, Prague, Czech Republic, abstract here (Talk)

2018 **Herbst, E. C.**, Doube, M., Smithson, T. R., Clack, J., Hutchinson. J. R. Paleopathologies in Carboniferous tetrapods and the evolution of bone healing. Society of Vertebrate Paleontology, 78th Annual Meeting, Albuquerque, New Mexico. (Poster)

2018 C. M. Holliday, **Herbst, E. C.**, M. Jacoby, A. Smolinsky, K. Sellers. Morphometric and modeling approaches to understanding the evolution of pseudosuchian mandibular symphyses. Society of Vertebrate Paleontology, 78th Annual Meeting, Albuquerque, New Mexico. (Talk)

2018 **Herbst, E. C.** New elements discovered in the early tetrapod *Crassigyrinus scoticus*.
DVM SICB Regional Meeting, Natural History Museum, London. (Talk)

2018 **Herbst, E. C.**, Smithson, T. R., Clack, J., Doube, M., Hutchinson. J.R. Bony lesions in early tetrapods and the evolution of bone healing. Society of Integrative and Comparative Biology Annual Meeting, San Francisco. (Talk)

2018 **Herbst, E. C.**, Smithson, T. R., Clack, J., Doube, M., Hutchinson. J.R. Bony lesions in early tetrapods and the evolution of bone healing. Society of Integrative and Comparative Biology Annual Meeting, San Francisco. (Talk)

2017 **Herbst, E. C.** and Hutchinson, J. R. New insights into the morphology of the Carboniferous tetrapod *Crassigyrinus scoticus* gleaned from computer tomography. The Early Tetrapod World: a one-day conference celebrating the career of Prof Jenny Clack FRS. University of Cambridge. (Invited Conference Talk)

2017 **Herbst, E. C.**, Smithson, T. R., Clack, J., Hutchinson. J. R 2017. Pathology in the early tetrapod *Crassigyrinus scoticus*. Progressive Palaeontology Annual Meeting, University of Leicester. (Talk)

Teaching

Teaching Positions

2021,2022	Bio 262 Evolutionary Morphology of Vertebrates - Issues and Methods University of Zurich
2020	Bio 267, Paleobiology and Evolution of Vertebrates, University of Zurich
2016-2019	Research Skills Facilitator, Royal Veterinary College, London
2017-2018	Comparative Animal Locomotion Module, Royal Veterinary College, London

Lectures

2021,2022	*Using Computer Tools to Investigate Biomechanics of Animals*. Bio 262, University of Zurich
2020, 2021	*Using Computer Modeling to Investigate Biomechanics of Extinct Animals*. Bio267, University of Zurich

Supervision of Students

2022-present	Kehan Pan, Master's student in Biomedical Engineering (Biomechanics), ETH, Zurich (supervised semester project on FEA)
2019 - present	Dylan Bastiaans, PhD student, UZH
2019 - present	supervision of student projects in Bio 262 and 267

Tutoring

2017 - 2019	Postgraduate Writing Tutor, Royal Veterinary College, London
2011 - 2012	Private Tutor (Writing, Math)

Technical Skills and Programs

CT segmentation and 3D modeling	Mimics, Avizo, Blender, Rhino, photogrammetry
Analysis and Scripting	Matlab, Python, Java
finite element analysis & multibody dynamics	Hypermesh, Abaqus, Artisynth
scientific rotoscoping and animation	Maya
motion capture	Qualysis and Matlab
other	Latex

Open Access Work

Shared Workflows	• method for automatic segmentation of trabecular bone • Blender remeshing guide for FEA
FEZ initiative	Founder of Finite Element Zurich
CT data	CT stacks used in my papers are open access on Figshare
3D models	3D Models I created are available on Morphosource and Figshare
Open Access Course	Completed Open Life Science Program fall 2020

Professional Service

2021 - Present	Leading Artisynth Software Discussion Group
2020	organized Finite Element Analaysis Conference and Workshop with over 200 participants
2018	Session Chair, Society of Integrative and Comparative Biology Annual Meeting, San Francisco.
Peer Review	PNAS, Clinical Biomechanics, The Anatomical Record, Journal of Anatomy, Integrative Organismal Biology, Methods in Ecology and Evolution Integrative and Comparative Biology, Canadian Journal of Earth Sciences

Outreach and Volunteering

2021 - Present	Volunteering as English and Math tutor for refugees Students Across Borders
2022	Outreach video for Biomechanics Research and Innovation Challenge
2020	Interview with Real Scientists DE (in German)
2019	Outreach display, Early Tetrapod Evolution Night at the Vet College, Royal Veterinary College, London
2017	Outreach display, Early Tetrapod Evolution Annual Open Day, Royal Veterinary College, London
2017	Guest blog post about *Crassigyrinus* on Anatomy to You blog
2013-2016	Comparative anatomy outreach events at Safari West Wildlife Park

Professional Development and Certificates

2022	Good Clinical Practice online course and certification
2022	Data Analysis for Medical Research using R, Epidemiology, Biostatistics and Prevention Institute, UZH
2021	GAMMA Workshop Balgrist, Zurich: "Models, methods and functional tests in motion analysis". Accredited by Swiss Orthopaedics (6 credits) and Physio Swiss (12 credits)
2021	Scientific Programming with Python, Physics Department, UZH
2020	Open Life Science Course
2020	SlicerMorph 3D Morphometrics Course
2019	Avizo Course 3DMAGINATION Ltd.
2018	MatLab Fundamentals Course
2017	Teaching and Learning in Higher Education Certificate Royal Veterinary College, London

Languages

English:	fluent
German:	fluent